Exhibit A

Centro Plastica CiPiTENE® Recycled High Density Polyethylene Granules

Categories: Polymer; Thermoplastic; Polyethylene; HDPE

Material Notes: Bottle Grade. Source: Italian post-consumer plastic bottles coming from collection of municipal waste and selected by PE/PP matrix.

Vendors: No vendors are listed for this material. Please click here if you are a supplier and would like information on how to add your listing to this material.

Physical Properties	Metric	English	Comments
Density	0.950 g/cc	0.0343 lb/in³	ASTM D792
Melt Flow	0.200 - 0.300 g/10 min	0.200 - 0.300 g/10 min	190°/2,16Kg; ASTM D1238

Mechanical Properties	Metric	English	Comments
Elongation at Break	>= 400 %	>= 400 %	ASTM D638
Flexural Modulus	>= 0.900 GPa	>= 131 ksi	ASTM D790
Tensile Creep Modulus, 1 hour	>= 1000 MPa	>= 145000 psi	ASTM D638

Descriptive Properties			
Color		light green	

Some of the values displayed above may have been converted from their original units and/or rounded in order to display the information in a consistant format. Users requiring more precise data for scientific or engineering calculations can click on the property value to see the original value as well as raw conversions to equivalent units. We advise that you only use the original value or one of its raw conversions in your calculations to minimize rounding error. We also ask that you refer to MatWeb's disclaimer and terms of use regarding this information. Click here to view all the property values for this datasheet as they were originally entered into MatWeb.

Exhibit B

Oxford Polymers PC 1518 Unfilled Polycarbonate for Injection Molding

Categories: Polymer; Thermoplastic; Polycarbonate; Polycarbonate, Molded

Material Notes: Unfilled Polycarbonate for Injection Molding

Information provided by Oxford Polymers.

Vendors: No vendors are listed for this material. Please click here if you are a supplier and would like information on how to add your listing to this material.

Physical Properties	Metric	English	Comments
Specific Gravity	1.20 g/cc	1.20 g/cc	ASTM D792
Water Absorption	0.150 %	0.150 %	ASTM D570
Linear Mold Shrinkage	0.00600 cm/cm	0.00600 in/in	ASTM D955
Melt Flow	16.5 g/10 min	16.5 g/10 min	ASTM D1238

Mechanical Properties	Metric	English	Comments
Tensile Strength @ Break	68.9 MPa	10000 psi	ASTM D638
Tensile Strength @ Yield	62.1 MPa	9000 psi	ASTM D638
Elongation at Break	125 %	125 %	ASTM D638
Elongation at Yield	7.00 %	7.00 %	ASTM D638
Tensile Modulus	2.38 GPa	345 ksi	ASTM D638
Flexural Modulus	2.34 GPa	340 ksi	ASTM D790
Flexural Strength	27.6 MPa	4000 psi	ASTM D790
Compressive Strength	86.2 MPa	12500 psi	ASTM D695
Izod Impact, Notched	6.94 J/cm	13.0 ft-lb/in	At room temperature; ASTM D256

Thermal Properties	Metric	English	Comments
Deflection Temperature at 0.46 MPa (66 psi)	138 °C	280 °F	ASTM D648
Deflection Temperature at 1.8 MPa (264 psi)	129 °C	265 °F	ASTM D648
Flammability, UL94	V-2	V-2	

Processing Properties	Metric	English	Comments
Processing Temperature	271 °C	520 °F	

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Exhibit C

Diamond and Network Polymers ABS/PC 7901

Categories: Polymer; Thermoplastic; ABS Polymer; Polycarbonate/ABS Alloy, Unreinforced; Polycarbonate; Polycarbonate/ABS Alloy, Unreinforced (Polycarbonate)

Material Notes: **Description:** Injection Molding Grade, High Impact

Information provided by Diamond Polymers, Inc.

Vendors: No vendors are listed for this material. Please click here if you are a supplier and would like information on how to add your listing to this material.

Physical Properties	Metric	English	Comments
Specific Gravity	1.08 g/cc	1.08 g/cc	ASTM D792
Linear Mold Shrinkage	0.00500 - 0.00800 cm/cm	0.00500 - 0.00800 in/in	ASTM D955
Melt Flow	1.20 g/10 min	1.20 g/10 min	Procedure A Condition G (200°C/5 Kg); ASTM D1238
	5.90 g/10 min	5.90 g/10 min	Procedure A Condition I (230°C/3.8 Kg); ASTM D1238

Mechanical Properties	Metric	English	Comments
Hardness, Rockwell R	110	110	ASTM D785
Tensile Strength @ Yield	40.7 MPa	5900 psi	chs 2 in/min; ASTM D638
Flexural Modulus	1.72 GPa	250 ksi	Tangent, chs 0.05 in/min; ASTM D790
Izod Impact, Notched	4.81 J/cm	9.00 ft-lb/in	0.125 in bar at 23°C; ASTM D256

Thermal Properties	Metric	English	Comments
Deflection Temperature at 1.8 MPa (264 psi)	86.1 °C	187 °F	0.125 in bar Unannealed/Conditioned 48 hours at 23°C; ASTM D648
	100 °C	212 °F	0.125 in bar Annealed 4 hours at 80°C; ASTM D648
Vicat Softening Point	113 °C	235 °F	0.125 inch, 1 Kg; ASTM D1525
Flammability, UL94	HB	HB	

Processing Properties	Metric	English	Comments
Rear Barrel Temperature	229 - 260 °C	445 - 500 °F	
Middle Barrel Temperature	235 - 266 °C	455 - 510 °F	
Front Barrel Temperature	238 - 271 °C	460 - 520 °F	
Nozzle Temperature	238 - 271 °C	460 - 520 °F	
Melt Temperature	238 - 271 °C	460 - 520 °F	Melt temperatures above 530°F are not recommended, and may result in color shifts and or thermal instability.
Mold Temperature	37.8 - 82.2 °C	100 - 180 °F	Higher mold temperature can aid flow in processing, provides a better surface finish, and creates less residual stress in the finished products.
Drying Temperature	90.6 - 98.9 °C	195 - 210 °F	
Dry Time	2 - 4 hour	2 - 4 hour	
Moisture Content	<= 0.0200 %	<= 0.0200 %	
Back Pressure	0.345 - 1.03 MPa	50.0 - 150 psi	

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Exhibit D

ABW Plastics ABS 55 Pellets, Injection Grade

Categories: Polymer; Thermoplastic; ABS Polymer; Acrylonitrile Butadiene Styrene (ABS), Molded

Material Notes: GMP# 002-

Typical property data below. Material may be tailored to meet specific requirements. This data should be used only as a guide and no assurance can be granted by the company that all molded articles will exhibit duplicate properties as those listed.

Information provided by ABW Polymers.

Key Words: Poly(Acrylonitrile Butadiene Styrene)

Vendors: No vendors are listed for this material. Please click here if you are a supplier and would like information on how to add your listing to this material.

Physical Properties	Metric	English	Comments
Density	1.07 g/cc	0.0387 lb/in³	ASTM D792
Melt Flow	5.00 g/10 min	5.00 g/10 min	I, ASTM D - 1238

Mechanical Properties	Metric	English	Comments
Tensile Strength, Yield	34.5 MPa	5000 psi	ASTM D638
Elongation at Break	100 %	100 %	ASTM D638
Flexural Modulus	2.10 GPa	305 ksi	ASTM D790
Izod Impact, Notched	2.70 J/cm	5.06 ft-lb/in	ASTM D256

Thermal Properties	Metric	English	Comments
Deflection Temperature at 1.8 MPa (264 psi)	75.0 °C	167 °F	Unannealed; ASTM Data
	92.0 °C	198 °F	Annealed; ASTM Data
Vicat Softening Point	104 °C	219 °F	ASTM D1525
Flammability, UL94	HB	HB	

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Exhibit E

Melt Flow Index: More Than Just A Quality Control Rheological Parameter. Part I

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1. INTRODUCTION

The Melt Flow Index test originated in the laboratories of ICI, in the early stages of development of polyethylene, and was mainly used in the past for characterization and specifications of polyethylenes. It was specified as a standard rheological quality control test in the ISO, BS, and ASTM. However, each of the standard tests had a number of variants. For example, in the Method 105C of BS 2782 (1970),[1] three variants are described corresponding to ISO R292 (1967).[2] These two standards specifically refer to only "The Determination of Melt Flow Index of Polyethylene and Polyethylene Compounds." Later, its use was extended to other thermoplastics. The ISO R1133 (1969)[3] and later BS method 720A (1979)[4] used the same principle of test but carried a broader variation of test procedures to cover a number of different thermoplastics. The ASTM D1238 (1979)[5] and DIN 53735 (1977)[6] differ from ISO R1133 in respect of the number of different loading conditions that are allowed. When using the test method for polymers other than polyolefins, caution is necessary in selecting the appropriate conditions. ISO R1133, ASTM D1238, and DIN 53735 do not always agree on the suggested procedures. For example, ISO R1133 and ASTM D1238 mention a temperature of 200°C and a piston loading of 5 kg for determining the melt flow index value of ABS, whereas DIN 53735 offers two alternatives of 200°C with a loading of 21 kg or 220°C with a loading of 10 kg.

The basic principle employed in the melt flow index test by any of the standards is that of determining the rate of flow of molten polymer through a closely defined extrusion plastometer whose important parts are shown in Figure 1. The cylinder is of hardened steel and is fitted with heaters, lagged, and controlled for operation at the required temperature with an accuracy of ±0.5°C. The piston is made of steel and the diameter of its head is 0.075 ± 0.015 mm less than that of the internal diameter of the cylinder, which is 9.5 mm. The die (or "jet") has an internal diameter of 2.095 ± 0.005 mm or 1.180 mm ± 0.005 mm (depending on the procedure used) and is made of

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APPENDIX

TABLE AIa
Standard Testing Conditions of Temperature and Load as per ASTM 1238

Condition	Temp (°C)	Load Piston + Weight (kg)	Approximate Pressure (kg/cm²)	Approximate Pressure (psi)	Shear Stress (dyn/cm² × 10^{-5})
A	125	0.325	0.46	6.50	0.3
B	125	2.160	3.04	43.25	1.97
C	150	2.160	3.04	43.25	1.97
D	190	0.325	0.46	6.50	0.3
E	190	2.160	3.04	43.25	1.97
F	190	21.600	30.40	432.50	19.7
G	200	5.000	7.03	100.00	4.6
H	230	1.200	1.69	24.00	1.1
I	230	3.800	5.34	76.00	3.5
J	265	12.500	17.58	250.00	11.4
K	275	0.325	0.46	6.50	0.3
L	230	2.160	3.04	43.25	1.97
M	190	1.050	1.48	21.00	0.96
N	190	10.000	14.06	200.00	9.13
O	300	1.200	1.69	24.00	1.1
P	190	5.000	7.03	100.00	4.6
Q	235	1.000	1.41	20.05	0.91
R	235	2.160	3.04	43.25	1.97
S	235	5.00	7.03	100.00	4.6
T	250	2.160	3.04	43.25	1.97

TABLE AIb
Testing Conditions for Commonly Used Resins as per ASTM 1238

Resin	Condition
Acetals	E, M
Acrylics	H, I
Acrylonitrile–butadiene–styrene	G
Cellulose esters	D, E, F
Nylon	K, Q, R, S
Polychlorotrifluoroethylene	J
Polyethylene	A, B, D, E, F, N
Polycarbonate	O
Polypropylene	L
Polystyrene	G, H, I, P
Polyterephthalate	T
Vinyl acetal	C

TABLE AIc
Test Temperature Summary

Test Temperature (°C)	Condition
125	A, B
150	C
190	D, E, F, M, N, P
200	G
230	H, I, L
235	Q, R, S
250	T
265	J
275	K
300	O

TABLE AId
Test Load Summary

Load (kg)	Condition
0.325	A, D, K
1.000	Q
1.050	M
1.200	H, O
2.160	B, C, E, L, R, T
3.800	I
5.000	G, P, E
10.000	N
12.500	I
21.600	F

TABLE AIe
ASTM Specifications for Piston and Die Dimensions

	Piston	Die
Diameter	(0.3730 ± 0.0003 in. = 9.474 ± 0.007 mm)	(0.0825 ± 0.0002 in. = 2.095 ± 0.005 mm)
Length	(0.250 ± 0.005 in. = 6.35 ± 0.13 mm)	(0.315 ± 0.0008 in. = 8.00 ± 0.02 mm)